

# **SURVEY OF COLLEGE GRADUATES FOLLOW-UP RESULTS FROM THE UNCERTAIN SCIENTIST AND ENGINEER STATUS STUDY**

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## **I. Executive Summary**

The reinterview of the 1993 National Survey of College Graduates (NSCG) found that 4.6 percent of the respondents changed from scientist and engineer (S&E) status to non-S&E status, and vice-versa. People counted as non-S&E might really be S&E. This situation could have caused undercoverage in the 1995 NSCG.<sup>1</sup>

Working with NSF, we identified job and education categories likely to be at risk of S&E misclassification. There were 6,362 non-S&E cases in these categories. We considered including them in the sample to reduce the potential undercoverage. However, we decided the survey resources would be better spent on activities such as trying to complete interviews with persons classified as S&E in the 1993 survey. Instead we flagged the 78 cases who changed status in the reinterview for the follow-up sample.

The follow-up study was designed to ask special questions about the education or occupation status of respondents who switched S&E status by changing education or occupation during reinterview, and were not selected as part of the regular 1995 sample. (Attachment A categorizes the occupation and education codes by science and engineering and non-science and engineering).

Lessard and Bushery estimated that 6.6% of the non-S&E respondents in the 1993 NSCG would change their status to S&E if reinterviewed. We followed up 20 cases who switched in the reinterview, and only six of them switched in the follow-up.

Lessard and Bushery estimated that 4.7% of the S&E respondents in the 1993 NSCG would change to non-S&E if reinterviewed. We followed up six cases who switched in the reinterview, and four switched in the follow-up.

There were originally 78 cases identified as switchers in the 1993 reinterview. Some follow-up cases were lost as a result of noninterviews and other problems described below.

We looked at the responses for switchers to determine if there were any patterns in reporting of responses which would suggest difficulties with the questionnaire wording. From the small number of completed follow-up interviews, we were unable to detect any similarities in responses that would indicate common problems with reporting.

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<sup>1</sup> "The 1993 NSCG Reinterview: Investigation of Cases with Uncertain Non-Science/Engineering Status," James M. Lessard and John M. Bushery, QAEB/DSMD, December 19, 1994.

## II. Overview

### A. General Description of the Study

The Uncertain Scientist and Engineer Status Study was one of five subsamples of the 1993 National Survey of College Graduates followed up during the 1995 NSCG interviewing. The purpose was to collect information to guide research to improve the questionnaire for the next decade's NSCG.

The 1993 NSCG reinterview found that 78 persons, 4.6% of the reinterview respondents, changed from S&E to non-S&E or from non-S&E to S&E. This is evidence that in the full sample there were cases that were incorrectly classified and were erroneously included in (false positives) or excluded from (false negatives) the 1995 survey.

We have different concerns about the two groups. The false positives were included in the S&E universe, although not necessarily working as S&E during the reference week of 1995. We didn't ask about their occupation or education during the 1993 reference week.

False negatives were excluded from the 1995 survey, which targets scientists and engineers, causing undercoverage.

Based on 40 reinterviewed cases, Lessard and Bushery estimated that 6.6% of the non-S&E respondents would change their status to S&E if reinterviewed. Our plan was to follow those 40 cases in 1995 to get some idea of the undercoverage in the 1995 survey.

Thirty-eight cases switched out of S&E in the 1993 reinterview. Lessard and Bushery estimated that 4.7% of the 1993 S&E respondents would change their status if asked again. Twelve of the 38 were selected for the regular 1995 NSCG. We planned to interview the remaining 26 in the follow-up study, however, the reinterviews for twelve of them were not sufficiently complete. That left us with only 14 cases in the follow-up. It would be possible to combine this data with the 12 selected from the regular sample, but we have no plans to do so at this time.

### B. Description of Follow-up Sample

We determined S&E status from job or education codes in the 1993 NSCG questionnaire. If any of the three job code questions (A1, A15, or A35) or six education codes questions (major or minor for up to three degrees in D6) contained one of the S&E job or education codes in Attachment A, we classified the respondent as S&E. If none of the items contained an S&E code, we classified the respondent as non-S&E.

There were three groups of Uncertain S&E Status cases. They are respondents selected for reinterview in 1993 who, in the reinterview changed from:

- S&E to non-S&E and were selected for the regular 1995 sample;
- S&E to non-S&E and were not selected for the regular 1995 sample;
- non-S&E to S&E.

The first group was part of the regular sample and were interviewed by mail, CATI, and PV, if necessary. The other two groups were selected for the follow-up sample and were not part of the regular sample.

#### C. Interview Procedures

The two groups that were not part of the regular sample were interviewed at telephone centers throughout the country. There was no mail or CAPI. Attachment B shows the questionnaire used for the telephone interviews.

### III. Results of the Follow-up Study

We compiled a list of 78 cases that had changed S&E status during the 1993 NSCG reinterview as the frame for this study. Out of these 78 cases, 12 cases had been selected for the regular 1995 sample and were not included in the follow-up. For 12 additional cases, although we made a determination that they switched out for the reinterview report, we didn't get a response to the particular occupation or education question that we wanted to ask about in the follow-up sample. Therefore, they weren't included in the follow-up interviews.

The remaining 54 should have been in the follow-up. We attempted interviews with only 27 of the 40 who switched into S&E in the 1993 reinterview, and 10 the 14 who switched out. The other 17 cases were dropped by mistake. (See A Limitation of the Study.)

For one of the 37 cases in this study, the follow-up study information did not match up with the data from the original interview and reinterview. Further investigation showed that the person interviewed for the follow-up was the sample person for the original interview but not for the reinterview. Since we could not use the information from the reinterview to determine whether the person from the original interview was a switcher, we dropped this case from the study.

Tables 1 and 2 below include only the cases which meet the following criteria:

- The case was on the list sent to DSD to be included in the follow-up study.
- A completed questionnaire was returned.

Table 1 below shows the interview status of the 36 cases in the study by occupation and education and by whether they switched in or out of the S&E status during the 1993 reinterview. The 8 incomplete cases are noninterviews where the sample persons could not be located.

Table 1. S&E Follow-up Study Interview Status by Occupation and Education

Status	Total	%	Switched In	%	Switched Out	%
Total cases	36	100.0	26	100.0	10	100.0
Completed	28	77.8	20	76.9	8	80.0
Occupation	18	64.3	13	65.0	5	62.5
Education	10	35.7	7	35.0	3	37.5
Incomplete	8	22.2	6	23.1	2	20.0
Occupation	3	37.5	2	33.3	1	50.0
Education	5	62.5	4	66.7	1	50.0

Table 2 shows the 28 completed interview cases by occupation and education and by switcher status. The S&E classification was determined by the “best code” which is the occupation or education code assigned by NSF based on the follow-up study information.

Table 2. S&E Follow-up Study Interview Results by Occupation and Education by “Best Code” Status and by Switcher Status

Results	Total	%	Switched In	%	Switched Out	%
Total Interviews	28	100.0	20	100.0	8	100.0
Occupation, Total	18	64.3	13	65.0	5	62.5
S&E	5	27.8	4	30.8	1	20.0
Not S&E	9	50.0	7	53.8	2	40.0
Not enough info	4	22.2	2	15.4	2	40.0
Education, Total	10	35.7	7	35.0	3	37.5
S&E	3	30.0	2	28.6	1	33.3
Not S&E	7	70.0	5	71.4	2	67.7
Not enough info	0	0.0	0	0.0	0	0.0

This table shows that only 6 out of 20 (30.0%) persons who switched in to the S&E category in the reinterview also switched in the follow-up study. This isn’t very strong evidence, but it

suggests that possibly the 6.6% estimated by Lessard and Bushery is an overestimate of the number who would have switched in if we had included them in the 1995 NSCG.

Furthermore, of the cases who switched out of S&E in the reinterview, most (4 of the 6 where we were able to make a determination) also switched out in the follow-up. We may have saved some money if we were sure they were not S&E, but they are not a coverage problem in the 1995 NSCG.

#### IV. A Limitation of the Study

During the course of preparing the questionnaires to be sent to the field, a new list of cases was created. Only 36 of the 54 cases were sent for the field work along with an additional 22 possible switcher cases. Since we were uncertain about the eligibility of these 22 cases we decided to include only the 36 cases that were returned to us from the field and were from the original selection of cases.

Based on the information from the 1993 reinterview, the 22 new cases appear to be switchers, but it is possible that they were excluded for some reason. We have not been able to allocate the staff time to complete our investigation into the validity of the additional 22 cases. If they are valid switchers, that would mean the estimates of the number of potential switchers in the 1993 NSCG should have been higher than reported by Lessard and Bushery.

## Attachment A

### Science & Engineering Occupation Codes

021	Agricultural and food scientists
022	Biochemists and biophysicists
023	Biological scientists (e.g., botanists, ecologists, zoologists)
024	Forestry, conservation scientists
025	Medical scientists (excluding practitioners)
027	Other biological/life scientists
052	Computer system analysts
053	Computer scientists, except system analysts
054	Information systems scientists or analysts
055	Other computer, information science occupations
082	Aeronautical, aerospace, astronautical
083	Agricultural
084	Bioengineering and biomedical
085	Chemical
086	Civil, including architectural and sanitary
087	Computer engineer - hardware
088	Computer engineer - software
089	Electrical, electronic
090	Environmental
091	Industrial
092	Marine engineer or naval architect
093	Materials or metallurgical
094	Mechanical
095	Mining or geological
096	Nuclear
097	Petroleum
098	Sales
099	Other engineers
172	Mathematicians
173	Operations research analysts, modeling
174	Statisticians
176	Other mathematical scientists
191	Astronomers
192	Atmospheric and space scientists
193	Chemists, except biochemists
194	Geologists, including earth scientists
195	Oceanographers
196	Physicists
198	Other physical scientists
231	Anthropologists
232	Economists
233	Historians, science and technology
235	Political scientists
236	Psychologists, including clinical
237	Sociologists
238	Other social scientist
271	Agriculture
273	Biological Sciences

275	Chemistry
276	Computer Science
277	Earth, Environmental, and Marine Science
278	Economics
280	Engineering
286	Mathematical Sciences
287	Medical Science
289	Physics
290	Political Science
291	Psychology
293	Sociology
297	Other natural sciences, postsecondary teachers
298	Other social sciences, postsecondary teachers

## Non-Science & Engineering Occupation Codes

010	Artists, Broadcasters, Editors, Entertainers, Public Relations Specialists, Writers
026	Technologists/technicians in the biological/life
031	Accounting clerks, bookkeepers
032	Secretaries, receptionists, typists
033	Other administrative (e.g., record clerks, telephone operators)
040	Clergy and Other Religious Workers
051	Computer programmers (business, scientific, process control)
070	Counselors, Educational and Vocational
081	Architects
100	Electrical, electronic, industrial, mechanical
101	Drafting occupations, including computer drafting
102	Surveying and mapping
103	Other engineering technologists and technicians
104	Surveyors
110	Farmers, Foresters and Fishermen
111	Diagnosing/Treating Practitioners (e.g., dentists, optometrists, physicians, psychiatrists, podiatrists, surgeons, veterinarians)
112	Registered nurses, pharmacists, dietitians, therapists, physician assistants
113	Health Technologists and Technicians (e.g., dental hygienists, health record technologists/technicians, licensed practical nurses, medical or laboratory technicians, radiologic technologists/technicians)
120	Lawyers, Judges
130	Librarians, Archivists, Curators
141	Top and mid-level managers, executives, administrators (people who manage other managers)
151	Accountants auditors, and other financial specialists
152	Personnel, training, and labor relations specialists
153	Other management related occupations
171	Actuaries
175	Technologists/technicians in the mathematical sciences
197	Technologists/technicians in the physical sciences
200	Insurance, securities, real estate, and business services
201	Sales Occupations - Commodities Except Retail (e.g., industrial machinery/equipment/supplies, medical and dental equipment/supplies)
202	Sales Occupations - Retail (e.g, furnishings, clothing, motor vehicles, cosmetics)
221	Food Preparation and Service (e.g., cooks, waitresses, bartenders)
222	Protective services (e.g., fire fighters, police, guards)
223	Other services occupations, except health
234	Historians, except science and technology
240	Social Workers
251	Pre-kindergarten and kindergarten
252	Elementary
253	Secondary - computer, math or sciences
254	Secondary - social sciences
255	Secondary - other subjects
256	Special education - primary and secondary
257	Other precollegiate Teachers
272	Art, Drama, and Music
274	Business Commerce and Marketing
279	Education

281	English
282	Foreign Language
283	History
284	Home Economics
285	Law
288	Physical Education
292	Social Work
294	Theology
295	Trade and Industrial
296	Other health specialities
299	Other postsecondary
401	Construction trades, miners and well drillers
402	Mechanics and repairers
403	Precision/production occupations (e.g., metal workers, woodworker, butchers, bakers, printing occupations, tailors, shoemakers, photographic process)
404	Operators and related occupations (e.g., machine set-up, machine operators and tenders, fabricators, assemblers)
405	Transportation/material moving occupations
500	Other occupations not listed

## Science & Engineering Education Codes

601	Agriculture, economics
605	Animal sciences
606	Food sciences/technology
607	Plant sciences
608	Other agricultural sciences
620	Area/Ethnic Studies
631	Biochemistry and biophysics
632	Biology, general
633	Botany
634	Cell and molecular biology
635	Ecology
636	Genetics, animal and plant
637	Microbiology
638	Nutritional sciences
639	Pharmacology, human and animal
640	Physiology, human and animal
641	Zoology, general
642	Other biological sciences
671	Computer/information sciences, general
673	Computer science
674	Computer systems analysis
677	Other computer and information sciences
680	Environmental science studies
681	Forestry sciences (except management)
682	Other conservation/renewable natural resources
721	Aerospace, aeronautical, astronautical
722	Agricultural
723	Architectural
724	Bioengineering and biomedical
725	Chemical
726	Civil
727	Computer/systems
728	Electrical, electronics, communications
729	Engineering sciences, mechanics, physics
730	Environmental
731	General
732	Geophysical
733	Industrial
734	Materials, including ceramics and textiles
735	Mechanical
736	Metallurgical
737	Mining and minerals
738	Naval architecture and marine
739	Nuclear
740	Petroleum
741	Other engineering
771	Linguistics
830	Library science
841	Applied

842 Mathematics, general  
843 Operations research  
844 Statistics  
845 Other mathematics  
861 Philosophy of science  
871 Astronomy and astrophysics  
872 Atmospheric sciences and meteorology  
873 Chemistry  
874 Earth sciences  
875 Geology  
876 Geological sciences  
877 Oceanography  
878 Physics  
879 Other physical sciences  
891 Clinical  
892 Counseling  
893 Experimental  
894 General  
895 Industrial/Organizational  
896 Social  
897 Other psychology  
921 Anthropology and archeology  
923 Economics  
924 Geography  
925 History of science  
928 Political science and government  
929 Sociology  
930 Other social sciences

## Non-Science & Engineering Education Codes

602	Other agricultural business & production
610	Architecture/Environmental design (for architectural engineering)
651	Accounting
652	Actuarial science
653	Business administration and management
654	Business, general
655	Business/managerial economics
656	Business marketing/marketing management
657	Financial management
658	Marketing research
659	Other business management/administrative services
661	Communications, general
662	Journalism
663	Other Communications
672	Computer programming
675	Data processing technology
676	Information services and systems
682	Other conservation/renewable natural resources
690	Criminal Justice/Protective Services
701	Administration
702	Computer teacher education
703	Counselor education/guidance services
704	Educational psychology
705	Elementary teacher education
706	Mathematics teacher education
707	Physical education/coaching
708	Pre-elementary teacher education
709	Science teacher education
710	Secondary teacher education
711	Special education
712	Social science teacher education
713	Other education
751	Electrical and electronic technologies
752	Industrial production technologies
753	Mechanical engineering-related technologies
754	Other engineering-related technologies
760	English Language and Literature/Letters
772	Other foreign languages and literature
781	Audiology and speech pathology
782	Health services administration
783	Health/medical assistants
784	Health/medical technologies
785	Medical preparatory programs (e.g., pre-dentistry, pre-medical, pre-veterinary)
786	Medicine (e.g., dentistry, optometry, osteopathic, podiatry, veterinary)
787	Nursing (4 years or longer program)
788	Pharmacy
789	Physical therapy and other rehabilitation/therapeutic services
790	Public health (including environmental health and epidemiology)
791	Other health/medical sciences

800 Home Economics  
810 Law/Pre-Law/Legal Studies  
820 Liberal Arts/General Studies  
843 Operations research  
850 Parks, Recreation, Leisure, and Fitness Studies  
862 Other philosophy, religion, theology  
901 Public Administration  
902 Public policy studies  
903 Other public affairs  
910 Social Work  
922 Criminology  
926 History, other  
927 International relations  
941 Dramatic arts  
942 Fine arts, all fields  
943 Music, all fields  
944 Other visual and performing arts  
995 Other fields (Not Listed)

Attachment B

CASEID: \_\_\_\_\_

INTERVIEWER CODE: \_\_\_\_\_

**National Survey of College Graduates Special Follow-up Operation  
Uncertain Scientist and Engineer Occupation Status**

Hello, my name is (                    ) from the U.S. Bureau of the Census. We are doing a special follow-up study to a survey in which you participated a few years ago.

NOTE TO INTERVIEWER: *Verify that you have the right sample person using the information contained in Section I of the 1995 NSCG Locating Sheet for this sample person. If you do, continue with the interview. If not, thank the person for their time, end the interview, and then notify your supervisor.*

**Our study is a follow-up to the 1993 National Survey of College Graduates sponsored by the National Science Foundation and the Census Bureau. It involves certain occupations including [FILL occupation categories #1 from 1993 provided on the Locating Sheet].**

*1a.* \_\_\_\_\_

*1b.* \_\_\_\_\_

The Census Bureau is conducting this voluntary survey to help the National Science Foundation update information related to the Nation's college educated persons. We expect the average interview to take about 5 minutes, but actual time may vary. All information is confidential as required by Title 13, United States Code. We will use it only for statistical summaries. There are no penalties for not answering questions in this survey, authorized by the National Science Foundation Act of 1950, as amended.

Can you take a few minutes to answer these questions?

NOTE TO INTERVIEWER: *If the sample person requests a contact person, please provide him or her with the following name and address:*

Herman Fleming  
Division of Contract, Policy and Oversight  
National Science Foundation  
4291 Wilson Boulevard  
Arlington VA 22230

CASEID: \_\_\_\_\_

INTERVIEWER CODE: \_\_\_\_\_

**Continued - Uncertain Scientist and Engineer Occupation Status**

**In some cases, two occupations may be similar and we would like to understand the difference. In reviewing our data for this special study, we noticed that your response to the question about the type of job you held in April 1993 with [FILL name of employer]**

\_\_\_\_\_

**was listed under two different categories, [FILL occupation categories #2 from 1993].**

2a. \_\_\_\_\_

2b. \_\_\_\_\_

**1. Please tell me how the job you held in April 1993 relates to each of these categories? [READ job categories #2 again]. Make sure respondent discusses both categories.**

2a. \_\_\_\_\_

\_\_\_\_\_

2b. \_\_\_\_\_

\_\_\_\_\_

**2. If one category had to be selected, which do you feel is the best one for the job you held then?**

\_\_\_\_\_

\_\_\_\_\_

**Why?**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

CASEID: \_\_\_\_\_

INTERVIEWER CODE: \_\_\_\_\_

**Continued - Uncertain Scientist and Engineer Occupation Status**

NOTE TO INTERVIEWER: RESPONDENT SHOULD HAVE GIVEN AT LEAST (A) MOST IMPORTANT ACTIVITIES AND DUTIES, AND (B) MAJOR RESPONSIBILITIES, INCLUDING SUPERVISING. IF NOT:

PROBE 1: What do you feel were your most important activities and duties of that job? Obtain at least TWO activities.

PROBE 2: What were your major responsibilities on that job?

PROBE 3: About how many people did you supervise either directly or indirectly? Obtain separate numbers for “supervised directly” and “supervised indirectly.”

**These are all the questions I have. Thank you for your time.**

CASEID: \_\_\_\_\_

INTERVIEWER CODE: \_\_\_\_\_

**National Survey of College Graduates Special Follow-up Operation  
Uncertain Scientist and Engineer Education Status**

**Hello, my name is ( ) from the U.S. Bureau of the Census. We are doing a special follow-up study to a survey in which you participated a few years ago.**

NOTE TO INTERVIEWER: *Verify that you have the right sample person using the information contained in Section I of the 1995 NSCG Locating Sheet for this sample person. If you do, continue with the interview. If not, thank the person for their time, end the interview, and then notify your supervisor.*

**Our study is a follow-up to the 1993 National Survey of College Graduates. It involves certain people with degrees in [FILL occupation categories #1 from 1993 provided on the Locating Sheet].**

1a. \_\_\_\_\_

1b. \_\_\_\_\_

The Census Bureau is conducting this voluntary survey to help the National Science Foundation update information related to the Nation's college educated persons. We expect the average interview to take about 5 minutes, but actual time may vary. All information is confidential as required by Title 13, United States Code. We will use it only for statistical summaries. There are no penalties for not answering questions in this survey, authorized by the National Science Foundation Act of 1950, as amended.

Can you take a few minutes to answer these questions?

NOTE TO INTERVIEWER: *If the sample person requests a contact person, please provide him or her with the following name and address:*

Herman Fleming  
Division of Contract, Policy and Oversight  
National Science Foundation  
4291 Wilson Boulevard  
Arlington VA 22230

CASEID: \_\_\_\_\_

INTERVIEWER CODE: \_\_\_\_\_

**Continued - Uncertain Scientist and Engineer Education Status**

**In some cases, two degree fields may be similar and we would like to understand the difference.** In reviewing our data for this special study, we noticed that your response to the question about the degree field for your *[FILL type of degree 1]*

\_\_\_\_\_

**from** *[FILL name of academic institution for degree 1]*

\_\_\_\_\_

**that you received in** \_\_\_\_\_ *[FILL year degree 1 received]* **was listed under two different categories,** *[FILL categories #2 from 1993 Locating Sheet].*

2a. \_\_\_\_\_

2b. \_\_\_\_\_

**1. Please tell me how your degree field relates to each of these categories?** *[READ categories above again]. Make sure respondent discusses both categories.*

2a. \_\_\_\_\_

\_\_\_\_\_

2b. \_\_\_\_\_

\_\_\_\_\_

**2. If one category had to be selected, which do you feel is the best one for the** *[Fill type of degree 1]*

\_\_\_\_\_

You received in *[FILL year degree 1 received]*\_\_\_\_\_?

\_\_\_\_\_

\_\_\_\_\_

CASEID: \_\_\_\_\_

INTERVIEWER CODE: \_\_\_\_\_

**Continued - Uncertain Scientist and Engineer Education Status**

**Why?**

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NOTE TO INTERVIEWER: IF RESPONDENT IS UNSURE OR NOT ABLE TO GIVE YOU THE BEST CATEGORY OR A REASON:

PROBE: For that degree, about how many credit hours did you earn in different subject areas? We just need the subjects/areas with the largest number of credit hours.

Write each subject/area and the corresponding credit hours below

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**These are all the questions I have. Thank you for your time.**